

Description

CARPET CLEANING COMPOSITION WITH CITRUS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Serial No. 60/319,851, filed January 10, 2003, entitled "Carpet Cleaning Composition with Citrus."

BACKGROUND OF INVENTION

FIELD OF THE INVENTION

[0002] The invention relates to carpet and fabric cleaning compositions, and more specifically to a carpet cleaning composition that includes a combination organic solvent and fragrance. In one of its aspects, the invention relates to a carpet cleaning solution that includes an organic, citrus based, low volatility cleaning solvent.

DESCRIPTION OF THE RELATED ART

[0003] Conventional carpet and upholstery cleaning compositions typically contain anionic and/or nonionic surfactants, an

anti-soiling agent such as polymerized styrene/maleic anhydride, a solvent such as glycol ether, and a fragrance to impart a pleasant scent. Known carpet cleaning compositions are disclosed in the Campagna et al. U.S. Pat. No. 5,955,413 and Scialla et al. U.S. Pat. No. 5,928,384, both of which are incorporated herein by reference. Examples of commercially available cleaning solutions include: BISSELL Fiber Cleansing Formula, Hoover Steam Vac carpet/upholstery detergent, Dirt Devil carpet & rug shampoo, Rug Doctor Steam Cleaner, and Full Release Professional Carpet Cleaner by Oreck. The BISSELL Fiber Cleansing Formula comprises water; an anti-stain agent; an acrylate copolymer that functions as an anti-soil agent and a pH adjusting agent; an alkyl naphthalene sodium sulfonate, which is an anionic surfactant; a blend of two alkoxylated lineal alcohols, which is a nonionic surfactant; a trace of an anti-form agent; and a fragrance.

[0004] Carpet cleaning compositions should be stable and essentially free of volatile solvents, yet have a pleasant fragrance the remains with the carpet after cleaning. The fragrance qualities of liquid commercial products are greatly dependent on the plethora of volatile and semi-volatile organic compounds contained therein. However,

volatile organic compounds are known to deplete naturally occurring ozone in the upper atmosphere and are thus desirably avoided. Also, a small segment of the population is hypersensitive to even the slightest exposure to volatile organic compounds.

[0005] A fragrance having low volatility is d-limonene, commonly known as citrus oil. d-Limonene is also an effective solvent for cleaning products. U.S. Reissue Patent No. 36,982 to Melikyan et al. discloses a cleaning composition for a variety of industrial and household applications, including cleaning and removing spots from carpets, and comprising d-limonene and hydrogen peroxide. The background section of Melikyan '982 states that many other patents disclose the use of d-limonene, which provides a pleasant citrus-like aroma, as well as cleaning properties. Other cleaning compositions containing d-limonene are disclosed in U.S. Patent No. 4,511,488 to Matta and U.S. Patent No. 4,620,937 to Dellutri. The Matta '488 composition is said to be suitable for hard and/or flexible substrates and contains a minimum of 7.8 wt. % d-limonene. The concentration of d-limonene in the Dellutri '937 composition varies according to its purpose, and the preferred d-limonene concentration is 60 vol. %. The Dellutri

"937 composition is said to be useful for cleaning carpets.

[0006] U.S. Patent No. 6,326,344 to Levitt discloses a carpet cleaning composition that contains little or no surfactant for good emulsification and, thus, leaves no tacky residue upon drying. The composition comprises about 50–98 wt.% water, about 0.05–2 wt. % acid copolymer emulsifier, about 0–1 wt. % of at least one surfactant, and about 1–50 wt. % of at least one solvent. d-Limonene is listed as one of the many preferable water-insoluble solvents. Additionally, the composition may contain a buffer to maintain the pH of the composition within the range of about 4 to 10.

[0007] U.S. Patent No. 6,048,368 to Tcheou et al. discloses a cleaning method of treating a spot or stain on a textile fabric comprising the steps of applying a detergent composition to the spot or stain, placing an absorbent layer to one side of the textile fabric, and applying heat and pressure to the opposing side of the textile fabric so that some or all of the spot or stain is absorbed into the absorbent layer. The detergent composition contains 3–90 wt. % hydrophobic solvent, 5–50 wt. % surfactant, and 5–92 wt. % water. d-Limonene is a preferred solvent.

[0008] U.S. Patent No. 4,304,675 to Corey et al., U.S. Patent No.

4,566,980 to Smith, and U.S. Patent No. 4,873,000 to Weller all disclose various solid/dry carpet deodorants or treatments with citrus as a desirable fragrance.

[0009] In addition to the above patents, the use of d-limonene in carpet cleaning compositions is addressed in the article, "d-Limonene Bears Fruit," from the November 1998 issue of *Cleanfax* magazine. The article states that d-limonene "is experiencing growing acceptance as the solvent of choice for a number of cleaning applications. It is finding its way into steam cleaning, carpet shampoos, and spot-ting agents." The article further explains that d-limonene is a popular replacement for previously common solvents in the textile cleaning industry due to its low environmental impact and its fresh natural odor.

[0010] Furthermore, it is desirable to create a stable carpet cleaning solution that includes normally incompatible components such as terpene hydrocarbons, polysiloxane derivatives, and sulfo-methacrylic polymers without using excessive amounts of surfactant or co-solvents to achieve stability. Unstable formulations tend to create solids that separate and settle out of solution. A stable formulation maintains a liquid mixture without the formation of solids.

SUMMARY OF INVENTION

[0011] In one aspect, a carpet cleaning composition comprises water, a terpene hydrocarbon solvent that also functions as a fragrance, one or more surfactants, an anti-soil component, and an anti-stain component. The terpene hydrocarbon solvent is an organic, low volatility solvent produced from citrus oil extract. The terpene hydrocarbon solvent comprises d-limonene, and the d-limonene concentration is between about 0.1 and 5 wt. %, preferably between about 0.5 and 2.0 wt. %, and most preferably about 0.5 wt. %.

[0012] The anti-soil component can be a compound containing polysiloxane derivatives. The anti-soil component can be an acrylate copolymer. The anti-soil component concentration is between about 3 and 7 wt. % and preferably about 5 wt. %.

[0013] The anti-stain component can be a compound containing an acrylate resin. The anti-stain component concentration is between about 4 and 10 wt. % and preferably about 8 wt. %.

[0014] The one or more surfactants comprises at least one of an anionic and a nonionic surfactant. The one or more surfactants can comprise a linear primary alcohol ethoxylate. The one or more surfactants can further comprise a blend

of two alkoxylated lineal alcohols. The one or more surfactants can further comprise an alkyl naphthalene sodium sulfonate. The one or more surfactants concentration is between about 4 and 7 wt. % and preferably about 5.5 wt. %.

[0015] The carpet cleaning composition can further comprise a pH adjusting agent to maintain a pH in the carpet cleaning composition between 8.5 and 9.5 and preferably at about 9.0. The pH adjusting agent can be an alkali metal hydroxide. The pH adjusting agent concentration is between about 1 and 6 wt. % and preferably between about 1 and 2 wt. %.

[0016] The carpet cleaning composition can further comprise an anti-foam agent. The anti-foam agent concentration is between about 0.1 and 1 wt. %.

[0017] The water concentration is between about 70 and 85 wt. %.

[0018] In another aspect, a carpet cleaning composition comprises 0.5 to 2.0 % by weight a terpene hydrocarbon solvent that also functions as a fragrance, 4.0 to 7.0 % by weight one or more surfactants, 3.0 to 5.0 % by weight an anti-soil component, 4.0 to 10.0 % by weight an anti-stain component, and 70 to 85 % by weight water. The terpene

hydrocarbon solvent concentration is preferably 0.5 % by weight, the one or more surfactants concentration is preferably 5.5 % by weight, the anti-soil component concentration is preferably 5.0 % by weight, the anti-stain component concentration is preferably 8.0 % by weight, and the water concentration is preferably 79.15 % by weight.

[0019] The carpet cleaning composition can further comprise a pH adjusting agent to maintain a pH in the carpet cleaning composition between 8.5 and 9.5. The carpet cleaning composition can further comprise 0.1 to 1.0 % by weight an anti-foam agent. The terpene hydrocarbon solvent is d-limonene.

DETAILED DESCRIPTION

[0020] A carpet and fabric composition for a carpet and fabric cleaning solution includes a solvent that functions as a cleaner and also as a fragrance, at least one surfactant, a pH adjusting agent, and, optionally, an anti-foam agent. The cleaning composition can also include one or more protectants, including an anti-stain and/or anti-soil agent. An example of the anti-stain agent is a compound containing acrylate resin, such as PM 1874, manufactured by the 3M Company. Suitable anti-stain agents are dis-

closed in U.S. Patent No. 5,948,480, which is incorporated herein by reference. An example of the anti-soil agent is a compound containing polysiloxane derivatives, such as PM 1870, which is also manufactured by the 3M Company. Suitable anti-soil agents are disclosed in U.S. Patent Nos. 6,043,209; 5,534,167; and 5,888,290, which are incorporated herein by reference. Other agents may include acrylate copolymers, such as Syntran HX15-18, manufactured by Interpolymer Corporation.

[0021] In the preferred embodiment, the solvent is an organic, low volatility citrus based solvent combined with deionized water. The organic, low volatility citrus solvent is any one of the group generally referred to as terpene hydrocarbons. Preferably, the terpene hydrocarbon is d-limonene, which is one of the two isomeric forms of limonene. d-Limonene is a naturally occurring citrus oil extract and is a desirable hydrophobic solvent because it maintains a stable liquid formulation and is not known to deplete naturally occurring ozone in the upper atmosphere. Furthermore, d-limonene serves as a pleasant fragrance, and therefore, supplemental fragrances are unnecessary. d-Limonene is also a plasticizer, and high concentrations thereof can soften, swell, or otherwise de-

grade or damage polymeric materials, such as those that compose its container or components of a carpet cleaning machine. To avoid such damage, the concentration of d-limonene in the cleaning composition is low, preferably between 0.1 and 2.5 wt. % and most preferably between 0.5 and 2.0 wt. %. In addition, the deionized water is preferred as a solvent medium for the cleaning composition. The deionized water will prevent the contamination of the cleaning solution from trace minerals in the water. The deionized water serves as a solvent for the cleaning agent and evaporates with little or no residue after delivering cleaning agents to the carpet or upholstery. Optionally, a glycol ether can be included as a solvent. Specifically, propylene glycol methyl ether, or Glycol Ether PM, can be present in the range of 1.0 to 1.5 wt. %.

[0022] The surfactant in the cleaning composition stabilizes the terpene hydrocarbon in solution and creates minimum residue that can be vacuumed and removed after the cleaning process. The surfactant can be one or a combination of surfactants, including nonionic and anionic surfactants. Suitable nonionic surfactants include blends of two alkoxylated lineal alcohols, such as Poly Tergent Blend 3-1, which is manufactured by BASF Corporation, a sec-

ondary alcohol ethoxylate, such as Tergitol 15-s-40, manufactured by Dow Chemical Company, a primary linear alcohol ethoxylate, such as Tomadol 1-5, or a linear alcohol alkoxylate, such as Nonidet SF-5. Tomadol 1-5 and Nonidet SF-5 are both available from Tomah Products. Tomadol 1-5 is made from C-11 alcohol and ethylene oxide and especially effective at stabilizing d-limonene in solution. The nonionic surfactants can be present in the range of about 1.0 to 3.0 wt. %. A suitable anionic surfactant is an alkyl naphthalene sodium sulfonate, such as Petro ULF, manufactured by AKZO Nobel. Further, Colamulse SBC, manufactured by Colonial Chemical Company, is an acceptable emulsifier for citrus oils.. The anionic surfactant can be present in suitable amounts, for example between about 1.0 and 3.0 wt. %.

[0023] The pH adjusting agent adjusts and stabilizes the composition. The pH adjusting agent maintains the pH in the cleaning solution between 8.5 and 9.5, preferably about 9.0. A typical pH adjusting agent is a sulfonated copolymer such as Alcosperse EXP 3779, manufactured by Alco Chemical. Other suitable pH adjusting agents include ethyleneditetramine, commonly known as EDTA; sodium hydroxide, NaOH, in percentages between 10% and 50%;

potassium hydroxide, KOH; and phosphates.

[0024] The optional anti-foam agent controls the amount of foam in the cleaning solution. An exemplary anti-foam agent is an organofunctional silicone antifoam, such as DSP Anti-Foam, manufactured by Dow Corning Corporation.

[0025] *Specific Examples*

[0026] *Example 1*

[0027] A cleaning composition was prepared with the following ingredients:

<i>Ingredient</i>	<i>Primary Function</i>	<i>% Weight</i>
Deionized Water	Solvent	79.15
d-Limonene	Solvent	0.5
PM 1874 ¹	Anti-stain agent	8.0
Syntran HX15-18 ²	Anti-soil agent	5.0
Petro ULF ³	Anionic surfactant	3.0
Poly Tergent Blend 3-1 ⁴	Nonionic surfactant	2.0
Tomadol 1-5 ⁵	Nonionic surfactant	0.5
NaOH, 50%	pH adjusting agent	1.78
DSP Anti-Foam ⁶	Anti-foam agent	0.07
<i>pH</i>		<i>8.99</i>

[0028] ¹ Compound containing acrylate resin, manufactured by

the 3M Company

[0029] ² Acrylic polymer, manufactured by Interpolymer Corporation

[0030] ³ Alkyl naphthalene sodium sulfonate, manufactured by AKZO Nobel

[0031] ⁴ Blend of two alkoxyated lineal alcohols, manufactured by BASF Corporation

[0032] ⁵ Linear primary alcohol ethoxylate, manufactured by Tomah Chemical Company

[0033] ⁶ 10% active organofunctional silicone antifoam, manufactured by Dow Corning Corporation

[0034] To evaluate the effectiveness of the cleaning composition, a test was conducted in accordance with a modified version of CSMA DCC-03 performance testing entitled Rug Shampoo. A spectrophotometer measurement was taken on a swatch of new carpet. An artificial soil was applied to the carpet and the soil was distributed and worked into the carpet by means of ceramic ball-milling cylinders inside the test chamber as it rotated. A spectrophotometer measurement was taken on the soiled carpet. An upright extraction cleaning machine utilizing the composition of Example 1 was used to clean the carpet and a final spectrophotometer measurement was taken. Cleaning perfor-

mance was calculated from the spectrophotometer values.

The carpet was satisfactorily cleaned.

[0035] Other compositions of the cleaner set forth below were prepared by mixing ingredients as set forth above and tested as above. All performed satisfactorily when sprayed onto a stained carpet or upholstery fabric.

[0036] *Examples 2-5*

<i>Ingredient (Primary Function)</i>	<i>% Weight Example 2</i>	<i>% Weight Example 3</i>	<i>% Weight Example 4</i>	<i>% Weight Example 5</i>
Deionized Water(Solvent)	82.93	82.93	82.93	81.93
d-Limonene(Solvent)	1.0	0.5	1.0	2.0
Glycol Ether PM(Solvent)	1.0	1.5	1.0	-----
PM 1874 ¹ (Anti-stain agent)	4.0	4.0	4.0	4.0
Syntran HX15-18 ² (Anti-soil agent)	5.0	5.0	5.0	5.0
PM 1870 ⁷ (Anti-soil agent)	0.5	0.5	0.5	0.5
Petro ULF ³ (Anionic surfactant)	3.0	3.0	2.5	2.5
Colamulse SBC ⁸ (Anionic surfactant)	-----	-----	1.0	2.0
Poly Tergent Blend 3-1 ⁴	2.0	2.0	2.0	2.0

(Nonionic surfactant)				
Tergitol 15-s-40 ⁹ (Nonionic surfactant)	0.5	0.5	----	----
DSP Anti-Foam ⁶ (Anti-foam agent)	0.07	0.07	0.07	0.07

- [0037] ¹ Compound containing acrylate resin, manufactured by the 3M Company
- [0038] ² Acrylic polymer, manufactured by Interpolymer Corporation
- [0039] ³ Alkyl naphthalene sodium sulfonate, manufactured by AKZO Nobel
- [0040] ⁴ Blend of two alkoxyated lineal alcohols, manufactured by BASF Corporation
- [0041] ⁶ 10% active organofunctional silicone antifoam, manufactured by Dow Corning Corporation
- [0042] ⁷ Compound containing polysiloxane derivatives, manufactured by the 3M Company
- [0043] ⁸ Emulsifier for citrus oils, manufactured by Colonial Chemical Company
- [0044] ⁹ Secondary alcohol ethoxylate, manufactured by Dow Chemical Company
- [0045] *Examples 6 and 7*

<i>Ingredient(Primary Function)</i>	<i>% Weight Example 6</i>	<i>% Weight Example 7</i>
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Deionized Water(Solvent)	76.50	77.48
d-Limonene(Solvent)	0.50	0.50
PM 1874 ¹ (Anti-stain agent)	8.00	8.00
Syntran HX15-18 ² (Anti-soil agent)	5.00	5.00
Petro ULF ³ (Anionic surfactant)	3.00	2.50
Poly Tergent Blend 3-1 ⁴ (Nonionic surfactant)	2.00	-----
Tomadol 1-5 ⁵ (Nonionic surfactant)	0.50	1.00
Nonidet SF-5 ¹⁰ (Nonionic surfactant)	-----	1.00
NaOH, 20%(pH adjusting agent)	4.43	4.45
DSP Anti-Foam ⁶ (Anti-foam agent)	0.07	0.07
<i>pH</i>	<i>9.16</i>	<i>9.26</i>

[0046] ¹ Compound containing acrylate resin, manufactured by the 3M Company

[0047] ² Acrylic polymer, manufactured by Interpolymer Corporation

[0048] ³ Alkyl naphthalene sodium sulfonate, manufactured by AKZO Nobel

[0049] ⁴ Blend of two alkoxylated lineal alcohols, manufactured by BASF Corporation

[0050] ⁵ Linear primary alcohol ethoxylate, manufactured by

Tomah Chemical Company

[0051] ⁶ 10% active organofunctional silicone antifoam, manufactured by Dow Corning Corporation

[0052] ¹⁰ Linear alcohol alkoxylate, manufactured by Tomah

Products

[0053] *Examples 8–11*

<i>Ingredient (Primary Function)</i>	<i>% Weight Example 8</i>	<i>% Weight Example 9</i>	<i>% Weight Example 10</i>	<i>% Weight Example 11</i>
Deionized Water(Solvent)	74.01	73.60	75.57	76.01
d-Limonene(Solvent)	2.0	2.0	1.0	1.0
PM 1874 ¹ (Anti-stain agent)	8.0	8.0	8.0	8.0
Syntran HX15-18 ² (Anti-soil agent)	5.0	----	----	5.0
Petro ULF ³ (Anionic surfactant)	2.5	2.5	2.5	2.5
Colamulse SBC ⁸ (Anionic surfactant)	2.0	2.0	1.0	1.0
Poly Tergent Blend 3-1 ⁴ (Nonionic surfactant)	2.0	2.0	2.0	2.0
NaOH, 20 %(pH adjusting agent)	4.42	4.83	4.86	4.42
Alcosperse EXP 3779 ¹¹ (pH adjust-	----	5.0	5.0	----

ing agent)				
DSP Anti-Foam ⁶ (Anti-foam agent)	0.07	0.07	0.07	0.07
<i>pH</i>	8.98	9.01	9.12	9.03

- [0054] ¹ Compound containing acrylate resin, manufactured by the 3M Company
- [0055] ² Acrylic polymer, manufactured by Interpolymer Corporation
- [0056] ³ Alkyl naphthalene sodium sulfonate, manufactured by AKZO Nobel
- [0057] ⁴ Blend of two alkoxylated lineal alcohols, manufactured by BASF Corporation
- [0058] ⁶ 10% active organofunctional silicone antifoam, manufactured by Dow Corning Corporation
- [0059] ⁸ Emulsifier for citrus oils, manufactured by Colonial Chemical Company
- [0060] ¹¹ Sulfonated copolymer, manufactured by Alco Chemical
- [0061] The carpet cleaning composition of the present invention is an effective carpet cleaning formulation with affinity for oily based and heavy soils while imparting soil resistant properties to the fibers. Further, the invention provides improved soil and stain-resistance to manufactured carpet and/or fabric after thorough cleaning. Still further, the

composition according to the invention has the citrus oil extract that serves as a fragrance and an organic solvent without the need for additional fragrance components or solvents in the composition.

[0062] While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation. Reasonable variation and modification are possible within the foregoing disclosure without departing from the spirit of the invention, which is defined in the appended claims.